Karlite $Mg_7(BO_3)_3(OH)_4Cl$

Crystal Data: Orthorhombic. *Point Group:* 222. As needles, elongated along [001], composed of subparallel crystallites showing {110} and {001}, to 0.5 mm; always in rosettelike and fibrous aggregates.

Physical Properties: *Cleavage:* Perfect on {001}. Hardness = 5.5 D(meas.) = 2.80–2.85 D(calc.) = 2.85

Optical Properties: Semitransparent. *Color:* White, pale green, may have a brown oxidization crust; colorless in transmitted light. *Streak:* White. *Luster:* Silky.
Optical Class: Biaxial (–). *Orientation:* $X = c$; $Y = a$; $Z = b$. $\alpha = 1.589$ $\beta = 1.632$ $\gamma = [1.634]$ 2V(meas.) = 22°–25°

Cell Data: *Space Group:* $P2_12_12$. $a = 17.631(1)$ $b = 17.965(1)$ $c = 3.1041(2)$ Z = 4

X-ray Powder Pattern: Schlegeistal, Austria.
2.829 (100), 2.2522 (94), 12.53 (83), 3.947 (72), 2.6211 (72), 6.27 (67), 1.1907 (67)

Chemistry:

	(1)		(1)
SiO_2	0.02	K_2O	0.01
B_2O_3	22.92	F	0.16
Al_2O_3	2.96	Cl	3.26
FeO	2.27	H_2O^+	10.40
MnO	0.17	H_2O^-	0.63
MgO	58.90	$-O = (F, Cl)_2$	0.82
CaO	0.14	Total	[101.03]
Na_2O	0.01		

(1) Schlegeistal, Austria; by electron microprobe, total Fe as FeO, total Mn as MnO, B_2O_3 determined photometrically, H_2O by TGA, only $(OH)^{1-}$ present by IR, original total given as 100.40%; corresponds to $(Mg_{6.60}Al_{0.26}Fe_{0.14}Mn_{0.01}Ca_{0.01})_{\Sigma=7.02}(B_{0.99}O_{2.97})_3[(OH)_{4.37}O_{0.26}Cl_{0.42}F_{0.04}]_{\Sigma=5.09}$. (2) Do.; by electron microprobe, analysis not given; stated to correspond to $(Mg_{6.05}Al_{0.30}Fe^{3+}_{0.10}Fe^{2+}_{0.05})_{\Sigma=6.50}(BO_3)_3(OH)_4Cl_{0.40}$.

Occurrence: Probably formed by Alpine metamorphism, in a calcsilicate–carbonate lens in amphibolites (Schlegeistal, Austria).

Association: Calcite, dolomite, "chlorite", clinohumite, brucite, ludwigite (Schlegeistal, Austria); sakhaite (Siberia, Russia).

Distribution: Found in the Furtschaglkar, in the Schlegeistal, Zillertal, Tirol, Austria. From the Cerdagne district, Pyrénées-Orientales, France. At an undefined locality [Titovskoye boron deposit, Tas-Khayakhtakh Mountains, Sakha] in Russia

Name: To honor Dr. Franz Karl (1918–1972), Professor of Mineralogy and Petrography, Christian Albrechts University, Kiel, Germany, for his studies of the geology of the eastern Alps.

Type Material: Mineralogical Institute and Museum, University of Kiel, Kiel; Institute for Mineralogy and Crystallography, Technical University, Berlin, Germany, 85/72; Natural History Museum, Vienna, Austria, L7676; Natural History Museum, Paris, France; National Museum of Natural History, Washington, D.C., USA, 149050–149052.

References: (1) Franz, G., D. Ackermand, and E. Koch (1981) Karlite, $Mg_7(BO_3)_3(OH, Cl)_5$ a new borate mineral and associated ludwigite from the Eastern Alps. Amer. Mineral., 66, 872–877. (2) Bonazzi, P., S. Menchetti, C. Sabelli, and R. Trosti-Ferroni (1986) Karlite: crystal structure and chemical composition. Neues Jahrb. Mineral., Monatsh., 253–262.